EDITORIAL

DESTRUCTION OF AFLATOXINS IN CONTAMINATED MAIZE

An article in this issue of the journal by Nyandieka *et al.* describes destruction of aflatoxins in maize using an ammoniation procedure. Aflatoxins are naturally occurring mycotoxins produced by *Aspergillus flavus* and *Aspergillus parasiticus* which grow on cereals, oil seeds, spices and nuts. Favourable growth conditions for the mold include high moisture content and high temperature. Contamination can occur at pre-harvest, harvest and post harvest period. They were discovered around 1962 when groundnuts fed to turkeys were found to be contaminated with unknown substance leading to the death of the birds. Over 13 different types of aflatoxins are known, the most common ones being aflatoxins B_1, B_2, G_1, G_2, M_1 and M_2. The most toxic one is aflatoxin B_1. Acceptable limit of aflatoxins in cereals for human consumption is about 30 parts per billion (ppb). Aflatoxins are highly oxygenated heterocyclic compounds. They fluoresce strongly in the ultraviolet light (ca 365nm). Aflatoxins B_1 and B_2 produce blue fluorescence while G_1 and G_2 produce green fluorescence. After entering the body, aflatoxins are metabolised in the liver to a reactive epoxide intermediate. The liver is the principal organ affected. Aflatoxins are carcinogenic, hepatotoxic, mutagenic and teratogenic. In the dry state, aflatoxins are stable to heat up to the melting point. However in presence of moisture and high temperature there is incomplete but significant destruction of aflatoxins. Hence cooking of contaminated cereals does not decrease the level of toxicity adequately.

Over the years, bulk contamination of cereals has attracted much attention because of economic importance. It is difficult to envisage the total wastage of thousands of tons of cereals especially in developing countries where chronic hunger is the rule rather than exception. This becomes even more significant since cereals are staple food to a large population in Africa and Asia. In May 2010, 80% of a bumper harvest of maize in Kenya was found to be heavily contaminated with aflatoxins and therefore unfit for human consumption. Worse still, destroying this large amount of maize by burning or other methods present serious logistical problems.

Over the years, scientists have devoted a lot of human and financial resources to come up with a workable simple procedure which can be used to destroy mycotoxins in bulk cereals and make it safe for human and animal consumption. Various methods have been tried with varying degree of success. A recent article by Safra *et al.* in the Iranian Journal of Public Health, 39(2), 24–29, 2010 describes a procedure which uses citric acid for aflatoxins detoxification in rice. Several other methods are described in literature. These use acids, bases, oxidising agents, bisulphites and gases (ozone, chlorine). The ammoniation procedure described by Nyandieka *et al.* was described over 20 years ago by Park *et al.* (J. Assoc. Off. Anal. Chem. 712, 685–703, 1988). A literature survey shows that a suitable procedure for destroying aflatoxins in bulk cereals is yet to be developed.

A more recent novel method involves biocontrol technology in which a strain of *Aspergillus flavus* that does not produce aflatoxin (referred to as atoxigenic) is introduced in cereals to compete with *A. flavus* which produce aflatoxin (toxigenic). It is argued that the atoxigenic mold will outcompete and drastically reduce the population of toxigenic strains. The method is still at the early stage of research and development but looks promising.

Prof. C.K. Maitai
Editor-in-Chief.